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A METHOD FOR EVALUATING THE BENEFITS TO CROP YIELDS OF CONSERVATION PLANNING.

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One of the major incidental benefits to a flood control program on agricultural land is derived by conserving the soil which is reflected in the better maintenance of yields.

This may be easily evaluated by determining the present depth of topsoil remaining and on this basis comparing the expected rate of loss of topsoil, and consequent reduction of yields, under the present land use with rate of topsoil loss and yields to be expected under a revised land use flood control program. This comparison may be made for any given period of time. On the Connecticut Flood Control Survey it is proposed to use a period of 100 years.

The procedure is as follows. First from existing or calculated data determine the following items for any sample farm:

1. Present Land Use

    a. Present depth of topsoil for various acreages of crops with present farming practices.

    b. Rate of soil loss in inches for each crop to be expected with present land use.

    c. Depth of topsoil 100 years hence.

    d. Relation between crop yields and depth of topsoil.

    e. Existing crop yields of various crops on sample farms.

2. Revised Land Use with Soil Conservation Program

    a. Present depth of topsoil for various acreages of crops with revised land use program.

    b. Rate of soil loss in inches for each crop to be expected with a conservation program.

    c. Depth of topsoil 100 years hence.

    d. Relation between crop yields and depth of topsoil.

    e. Estimated crop yields at present time with a conservation plan.

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The practical use of this method is illustrated in the following example. The computations are for a typical sample farm on the Connecticut watershed. The total acreage in cropland and pasture at the present time 118.9, divided as follows:

Table 1

Land Use or Crop Rotation	Acreage	Length of Rotation in Years	Rotation Reference No.
Corn, oats, hay 6 years	40.0	8	I
Corn, corn, oats, hay 7 years	5.0	10	II
Potatoes, oats, hay 6 years	4.0	8	III
Pasture	67.4	-	-
Permanent Hay	2.5	-	-

The depth of topsoil on the farm was determined as follows. An erosion survey was made in the field. For soils on the Connecticut watershed, an original depth of 8" of topsoil was assumed. The relation between degree of erosion and depth of topsoil remaining is given in Table 2.

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Table 2 - Depth of Topsoil

Degree of Erosion	Topsoil Removed %	Topsoil Removed Inches	Average Inches of Soil Removed	Inches of Topsoil Remaining	Acreage
0	0	0	0	8	6.7
1	0-25	0-2	1	7	50.4
2	26-75	2-6	4	4	61.8
3	76-100	6-8	7	1	-
4	100	8-10 or 12	8,9,10	0(or less)	-

From this relationship and the erosion survey the average soil remaining may be determined for the various acreages of crops and pasture as follows.

Table 3 - Weighted Average for Depth of Topsoil

Acres Cropland	Average Depth of Soil Loss in Inches	Total Soil Loss in Acre Inches	Acres Pasture	Average Depth of Soil Loss in Inches	Total Soil Loss in Acre Inches
1.0	0	0	5.7	0	0
0.6	1	0.6	49.8	1	49.8
49.9	4	199.6	11.9	4	47.6
51.5		200.2	67.4		97.4

Average soil loss in inches per acre of cropland to date $\frac{200.2}{51.5} = 3.89$

Present average depth of soil in cropland = 8-3.9 = 4.1

Average soil loss in inches per acre of pasture to date $\frac{97.4}{67.4} = 1.4$

Present average depth of soil in pasture = 8-1.4 = 6.6

To determine the depth of topsoil after 100 years it is necessary to express soil loss in terms of average annual soil loss in tons per acre for each of the rotations on each sample farm.

Since rate of erosion varies with slope class of the crop land, the acres of each slope class for each individual rotation must be know. Where soil types vary considerably in depth of topsoil and erosiveness, the average annual soil loss should be calculated for each soil type as well as slope class for: (1) present system of farming (including one or more rotations on each farm) and (2) with conservation program. For the Connecticut River Flood Control Survey the average annual soil loss both with and without a flood control program has been computed and summarized in Table 9 by slope class for rotations commonly used. However, since most agricultural soils in areas surveyed during the past year have had similar erosion rates, no separation has been made to correct for difference in erodibility of various soils. These data were derived from conservation experiment stations, since no direct data are available for the Connecticut watershed.

The soil loss and depth of topsoil remaining 100 years hence with present farming practices are computed as follows: The present rotation system and acres involved are given in Table 1. From this, the rate of soil loss may be calculated as in Table. 4.

Table 4 - Soil Loss for Crop Land

Slope Class	Acres	Average Annual Soil Loss from Table 9 in tons per acres	Total Annual Soil Loss in Tons
Rotation I			
C	33.4	6.05	202.07
D	6.6	10.37	68.44
Rotation II			
B	5.0	2.79	13.95
Rotation III			
B	1.9	1.92	3.65
C	2.1	6.05	12.71
		Average annual total soil loss	300.82 per farm

There are approximately 150 tons of soil per acre inch. From this, the total soil loss for a period of 100 years in acre inches equals

$$\frac{300.82}{49.0} \times \frac{100}{150} = 4.1$$

For permanent hay and pasture, the soil loss may be computed in a similar manner. Table 5 gives the soil lossand depth of topsoil remaining 100 years hence with present farming practices.

Table 5 - Soil Depth 100 years Hence

Land Use	Acres	Present Depth of Topsoil - Inches	Soil Loss (Inches) in 100 Years	Depth of Topsoil 100 yrs Hence (in)
Rotated cropland	49.0	4.1	4.1	0.0
Permanent hayland	2.5	4.1	0.3	3.8
Pasture	67.4	6.60	2.7	3.9

The soil loss and depth of topsoil remaining 100 years hence with a flood control program may be computed in a similar manner when the acreage and crop rotations have been revised to conform with the program.

The revised rotation systems and acres involved are shown in Table 6.

Table 6 - Soil Loss with Conservation Program

Slope Class	Acres	Average Annual Soil Loss in Tons per Acre from Table 9	Total Annual Soil Loss in Tons
		Cropland	
Rotation I - Corn or potatoes, oats, hay 4 years - 6 year rotation			
B	6.9	0.63	4.35
C	26.1	2.71	70.73
Rotation II - Corn, oats, hay 6 years - 8 year rotation			
C	8.0	2.11	16.88
	41.0		91.96

Total soil loss for a period of 100 years $= \frac{91.96}{41.0} \times \frac{100}{150} = 1.5$ inches

		Permanent Hay	
C	0.9	0.3	0.27
D	8.7	0.4	3.48
	9.6		3.75

Total soil loss for a period of 100 years $= \frac{3.75}{9.6} \times \frac{100}{150} = 0.3$ inches

		Pasture	
Good Sod			
B	8.5	0.3	2.55
C	25.9	1.5	38.85
D	2.4	2.0	4.80
E	1.5	2.0	3.00
Poor Sod			
D	1.0	6.0	6.0
E	4.8	6.0	28.80
	44.1		84.00

Total soil loss for a period of 100 years = $\frac{84.0}{44.1} \times \frac{100}{150}$ = 1.3 inches

Table 7 gives the soil loss and depth of topsoil remaining 100 years hence with a conservation program.

Table 7 - Soil Loss with Conservation Program

Land Use	Acres	Present Depth of topsoil (inches)	Soil Loss in 100 years (inches)	Depth of Topsoil 100 Years Hence (inches)
Rotated Cropland	41.0	4.2	1.5	2.7
Permanent Hayland	9.4	4.0	0.3	3.7
Pasture	44.1	6.3	1.3	5.0

The correlation of yield with soil depth was based upon data furnished by the Allegheny Flood Control Survey and the Iowa Experiment Station.* The data were presented in tabular form and covered a period of one year except for the corn data from Iowa which included a two year period.

After plotting up the data, curves were derived by the least squares method to fit the points with equal weight given to each observation. The standard error of estimate and the correlation coefficient for each curve were determined. In all cases the trend shown was highly significant, both statistically and agriculturally. The equations used in plotting the curves, the standard errors of estimates, and the correlation coefficients are presented on the graphs, figures 1-4. Data from Iowa were collected during years of 1936 and 1937 and that for Allegheny Flood Control Survey in 1940, and yet all data show a high degree of correlation.

Yields as correlated with inches of topsoil have been measured by Allegheny Flood Control Survey and also in Iowa. The curves for corn grain yield are parallel but are at varying levels. Perhaps one explanation for higher yield of grain at Iowa is that the prairie topsoil is deeper and is not diluted as quickly with the B horizon as the soils of the Allegheny Flood Control Survey areas. Since the curves for grain yields for Iowa and Allegheny show a high degree of correlation and curves for oat yield are similar, the data collected on the Allegheny Flood Control Survey areas will be used on the Connecticut Survey as a basis for yield reduction from soil loss. Each depth of topsoil remaining has been determined and tabulated in Table 10 attached.

Thus at depth of topsoil of 4.1 inches with existing farming system (column 1 table 5) the yield (from table 10) for corn silage is 4.33 tons per acre. After 100 years of present system of farming only 0.0 inches of topsoil remain (column 4 table 5) which gives a yield of 3.19 tons per acre or 73.67% of present yield as reported by farmer (column 4 table 8) or an actual yield of 8.1 tons of dry silage per acre.

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*Iowa Research Bulletin #252 - Table 2.

The same procedure can be used in calculation of yield 100 years hence with conservation program in effect. The only exception is in column 9 of table 8 when yields are actually increased with the program due to increased use of fertilizer or better conservation of moisture and fertility which increases yields. Then the increased yields expected with conservation program can be used to determine the yields 100 years hence, rather than using present yields on the sample farms.

Pasture yields were considered to be those of hayland, with present system of farming, but with the improved yields due to conservation program and control of erosion they will vary from that of hay.

In table 8, the yields given are obtained from Table 10.

Table 8'

SOIL LOSSES IN INCHES

Land Use	With Present Farming System Inches of Topsoil			With SCS Flood Control system of farming Inches of Topsoil		
	Depth in Present Fields	Loss of Depth in 100 years	Depth in Present Fields After 100 years	Depth in Revised Fields	Loss of Revised Fields in 100 years	Depth After 100 years
Rotated Cropland	4.1	4.1	0.0	4.2	1.5	2.7
Permanent Hayland	4.1	0.3	3.8	4.0	0.3	3.7
Pasture Land	6.6	2.7	3.9	6.3	1.3	5.0

Yields as Correlated with Depth of Topsoil

	Present system of Farming Yields per Acre					With SCS Flood Control System of Farming Yields per Acre				
	From depth of present topsoil	From depth of topsoil 100 years hence	In % of present depth of topsoil for 100 years hence	As reported by farmer	From 100 years hence	From present depth of topsoil	From topsoil 100 years hence	in % of present depth of topsoil	With SCS system at present	For 100 years hence
Rotated Cropland										
Corn Silage tons Wet Weight	13.0	9.6		11.0	8.1	13.1	11.5		11.0	9.7
Corn Silage tons Dry Weight	4.33	3.19	73.7			4.36	3.83	87.8		
Potatoes (same as silage) Bushels			73.7	150	111.0			87.8	150	132
Corn Grain Bushels	22.5	11.8	52.4	None		22.8	18.7	82.0	None	
Oats Grain Bushels	28.2	15.2	53.9	None		28.5	26.8	94.0	None	
Hay Tons	0.77	0.47	61.0	1.25	0.8	0.78	0.67	85.9	1.25	1.1
Oat Hay (same as hay) Tons	"	"	"	2.0	1.2	"	"	"	2.0	1.7
Permanent Hay (same as hay) Tons	0.77	0.75	97.4	1.25	1.2	0.76	0.75	98.7	2.25	2.2
Pasture (same as hay) Tons	0.97	0.76	78.4	1.0	0.78	0.95	0.84	88.4	1.2	1.1
Total pasture Days				1800	1411				2250	1989

Table 9

Rotations commonly Found on Farms Surveyed for Connecticut River Flood Control Survey

Compiled from U. S. D. A. Circular 588, December 1940, or estimated for Connecticut from total of all data, available and from Field Study.

Rotations containing 1 year corn, 1 year oats, variable years hay, in tons of soil loss per acre

Without Control Practices						With Control Practices			
A	B	C	D	E	Slope Classes (1)	A	B	C	D
2.5	11.2	38.3	66.7	117.5	Corn 1 year	0.3	2.4	11.5	-
0.5	2.4	7.7	13.3	23.0	Small grains 1 year (2)	0.3	0.6	3.6	-
3.0	13.6	46.0	80.0	140.5	Total soil loss, tons per acre	0.6	3.0	15.1	
					6 year Rotation				
3.0	13.6	46.0	80.0	140.5	Corn 1 year, oats 1 year	0.6	3.0	15.1	25.2
0.8	1.2	1.6	2.0	2.5	Hay 4 years	0.4	0.8	1.2	1.6
3.8	14.8	47.6	82.0	143.0	Total loss per 6 years	1.0	3.8	16.3	26.8
0.63	2.47	7.93	13.67	23.83	Av.Ann.soil loss, tons per acres	0.17	0.63	2.17	4.47
					5 year Rotation				
3.0	13.6	46.0	80.0	140.5	Corn 1 year, oats 1 year	0.6	3.0	15.1	25.2
0.7	1.0	1.2	1.6	2.0	Hay 3 years	0.4	0.8	1.0	1.4
3.7	14.6	47.2	81.6	142.5	Total loss per 5 years	1.0	3.8	16.1	26.6
0.72	2.92	9.44	16.32	28.5	Av. ann. soil loss, tons per acre	0.2	0.76	3.22	5.3
					4 year Rotation				
					Corn 1 year, small grain 1 year				
					Hay 2 years				
0.85	3.55	11.70	20.25	35.42	Av. ann. soil loss, tons per acre	0.2	0.85	3.92	6.50
					3 year Rotation				
					Corn 1 year, oats 1 year				
					Hay 1 year				
1.07	4.63	15.47	26.83	47.03	Av. ann. soilloss, tons per acre	0.23	1.07	5.13	8.5
					8 year Rotation				
					Corn 1 year, small grain 1 year				
					Hay 6 years				
0.52	1.92	6.05	10.37	18.01	Av. ann. soil loss, tons per acre	0.15	0.52	2.11	3.4
					7 year Rotation				
					Corn 1 year, small grain 1 year				
					Hay 5 years				
0.57	2.15	6.86	11.79	20.5	Av. ann. soil loss, tons per acre	0.16	0.57	2.37	3.8

Table 9 continued

Irregular Rotations									
Without Control Practices					With Control Practices				
A	B	C	D	Slope Classes (1)	A	B	C	D	E
				Cover					
				Corn 1 year. After conservation planning this year of corn will be omitted					
				Corn 1 year					
				Small grains 1 year					
				Hay 3 years. After conservation planning - hay 4 years.					
0.91	4.48	15.23	26.6	Av. ann. soil loss, tons per acre	0.18	0.66	2.73	4.5	
				Small grains 1 year					
				Hay 5 years					
0.37	0.50	0.63	0.75	Av. ann. soil loss, tons per acre	0.13	0.25	0.37	0.58	
				Small grains 2 years					
				Hay 4 years					
0.50	0.70	0.87	1.0	Av. ann. soil loss, tons per acre	0.17	0.33	0.50	0.77	
Not fertilized				Permanent hays only	Fertilized				
0.2	0.3	0.4	0.5	Av. ann. soil loss, tons per acre	0.1	0.2	0.3	0.4	0.5
				8 year Rotation					
				Corn 2 years					
				Small grains 1year					
				Hay 5 years					
0.72	3.4	11.53	20.06	Av. ann. soil loss, tons per acre	0.18	0.8	3.85	6.4	
				6 year Rotation					
				Corn 2 years					
				Small grains 1 year					
				Hay 3 years					
0.9	4.5	15.2	26.6	Av. ann. soil loss, tons per acre	0.22	1.03	5.05	8.43	
				11 year Rotation					
				Corn 2 years					
				Oats 1 year					
				Hay 8 years					
0.58	2.55	8.49	14.73	Av. ann. soil loss, tons per acre	0.15	0.64	2.88	4.76	
				10 year Rotation					
				Corn 1 year					
				Oats 1 year					
				Hay 8 years					
0.46	1.6	4.9	8.4	Av. ann. soil loss, tons per acre	0.14	0.46	1.75	2.84	

Pasture Erosion rates

Average annual soil loss in tons per acre

Cover	Slope Class A	B	C	DE
Poor sod and brushy pastures P_3 - P_b as mapped	0.75	2.1	4.1	6.0
Good sod and pasture (including fertilized pasture) either before or after programs P_1 - P_2	0.15	0.30	1.5	2.0 (3)

(1) A slopeclass - 0 - 5% slope
B slope class -6 - 15% slope
C slope class - 16 - 25% slope
D slope class - 26 - 35% slope
E slope class - 36% or greater slope

(2) Small grains include oats, rye, millet, barley, wheat.

(3) Pasture on D and E slope is usually punched up badly, leaving bare areas sub- will erosion and good pasture occurs only in extremely small areas. D and E . occur in planned pastures only in lanes or areas uneconomical to fence ou

Table 10

Hay and Corn Ensilage Yields

From second degree curve fitted to existing data from Allegheny Flood Control Survey

	Inches of Topsoil Remaining (1)										
	Unit Inches	Tenth Inches 0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
		Yield of Hay in Tons per Acre									
Projection of	-2.0	0.33									
Curve beyond	-1.0	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.35	0.34	0.34
Range of Data	-0.0	0.47	0.46	0.45	0.45	0.44	0.44	0.43	0.43	0.42	0.41
	0.0	0.47	0.48	0.49	0.49	0.50	0.50	0.51	0.52	0.53	0.54
	1.0	0.54	0.55	0.55	0.56	0.57	0.57	0.58	0.59	0.60	0.61
	2.0	0.62	0.63	0.64	0.64	0.65	0.65	0.66	0.67	0.68	0.68
	3.0	0.69	0.70	0.71	0.72	0.73	0.74	0.74	0.75	0.75	0.76
	4.0	0.76	0.77	0.78	0.79	0.80	0.80	0.81	0.82	0.83	0.84
From Curve	5.0	0.84	0.85	0.86	0.87	0.88	0.88	0.89	0.90	0.91	0.92
of Data	6.0	0.93	0.94	0.94	0.95	0.96	0.96	0.97	0.98	0.99	1.00
	7.0	1.02	1.03	1.03	1.04	1.05	1.05	1.06	1.07	1.08	1.09
	8.0	1.10	1.11	1.12	1.13	1.14	1.14	1.15	1.16	1.17	1.18
	9.0	1.19	1.20								
		Yield of Corn Silage in Tons per Acre (2)									
	-2.0	2.64									
Projection of	- 1.0	3.00	2.98	2.96	2.94	2.93	2.91	2.90	2.88	2.86	2.85
Curve Beyond	-0.0	3.19	3.17	3.15	3.13	3.10	3.08	3.05	3.04	3.03	3.01
Range of Data	0.0	3.19	3.21	3.23	3.24	3.25	3.27	3.30	3.32	3.35	3.37
	1.0	3.39	3.41	3.43	3.45	3.47	3.50	3.53	3.55	3.58	3.61
	2.0	3.65	3.66	3.68	3.71	3.74	3.77	3.80	3.83	3.86	3.90
	3.0	3.93	3.97	4.00	4.04	4.07	4.11	4.14	4.18	4.23	4.26
	4.0	4.29	4.33	4.36	4.40	4.44	4.48	4.52	4.57	4.62	4.66
From Curve	5.0	4.70	4.75	4.80	4.85	4.90	4.94	4.98	5.03	5.07	5.13
of Data	6.0	5.19	5.23	5.28	5.34	5.40	5.45	5.50	5.56	5.62	5.67
	7.0	5.73	5.77	5.84	5.89	5.95	6.01	6.07	6.13	6.20	6.27
	8.0	6.33	6.39	6.45	6.50	6.55	6.61	6.68	6.75	6.83	6.89
	9.0	6.95	7.02	7.08	7.17	7.25	7.30	7.35	7.42	7.50	7.58
	10.0	7.65									

(1) Table arranged similar to logarithm tables

(2) Tons reported in the table = wet silage weight divided by 3.

Table 10 (continued)

Yields of Grain for Corn and Oats

From second degree curve fitted to existing data from Allegheny Flood Control Survey

	Unit Inches	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
		Yield of Corn Grain in Bushels per Acre									
	-2.0	7.0									
Projection of Curve Beyond Range of Data	-1.0	9.2	9.0	8.8	8.6	8.4	8.3	8.2	7.9	7.6	7.3
	0.0	11.8	11.5	11.2	11.0	10.8	10.5	10.2	10.0	9.8	9.5
	0.0	11.8	11.9	12.0	12.3	12.6	12.9	13.2	13.5	13.8	14.0
	1.0	14.2	14.5	14.8	15.0	15.2	15.5	15.8	16.0	16.3	16.6
	2.0	16.8	17.0	17.2	17.5	17.8	18.1	18.4	18.7	19.0	19.2
	3.0	19.4	19.7	20.0	20.3	20.5	20.8	21.0	21.3	21.6	21.9
	4.0	22.1	22.5	22.8	23.0	23.2	23.5	23.8	24.1	24.3	24.7
From Curve of Data	5.0	25.0	25.3	25.5	25.8	26.0	26.3	26.6	26.9	27.2	27.5
	6.0	27.8	28.1	28.3	28.7	29.0	29.3	29.5	29.8	30.1	30.5
	7.0	30.8	31.1	31.3	31.7	32.0	32.3	32.6	32.9	33.1	33.5
	8.0	33.8	34.1	34.4	34.7	35.0	35.3	35.6	35.9	36.2	36.6
	9.0	37.0	37.3	37.5							
		Yield of Oats in Bushels per Acre									
	-2.0	10.0									
	-1.0	12.5	12.3	12.0	11.8	11.5	11.3	11.0	10.8	10.5	10.3
Projection of Curve Beyond Range of Data	-0.0	15.2	14.9	14.6	14.3	14.0	13.7	13.4	13.2	13.0	12.8
	0.0	15.2	15.5	15.7	15.9	16.2	16.4	16.7	17.0	17.2	17.6
	1.0	17.9	18.2	18.5	18.8	19.1	19.5	19.8	20.1	20.5	20.8
	2.0	21.0	21.4	21.8	22.1	22.4	22.7	23.0	23.4	23.8	24.1
	3.0	24.3	24.6	25.0	25.4	25.8	26.1	26.5	26.8	27.0	27.4
	4.0	27.9	28.2	28.5	28.8	29.2	29.6	30.0	30.3	30.6	30.9
From Curve of Data	5.0	31.3	31.7	32.0	32.4	32.8	33.2	33.5	33.9	34.2	34.6
	6.0	35.0	35.4	35.8	36.0	36.3	36.7	37.0	37.4	37.8	38.1
	7.0	38.5	38.9	39.3	39.7	40.0	40.4	40.7	41.0	41.3	41.7
	8.0	42.2	42.6	43.0	43.3	43.5	43.9	44.3	44.7	45.0	45.4
	9.0	45.8	46.3	46.8	47.1	47.4	47.7	48.0			

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Survey

May 17, 1941

MEMORANDUM for Mr. Mollenhauer:

Discussion of Method for Evaluation of the Benefits to Crop Yields of Conservation Planning

The rate of soil loss for each rotation is best expressed as average annual soil loss in tons per acre. Since rate of erosion varies with slope class (and percent) of cropland, the acres of each slope class for each individual rotation must be known from conservation data. Where soil types vary considerably indepth of topsoil and erosiveness, the average annual soil loss should be calculated for each soil in addition to slope class for each rotation for: (a) present system of farming (including one or more rotations on each farm) and (b) with Soil Conservation Service program. For the Connecticut River Flood Control Survey the average annual soil loss both with and without a soil conservation program has been computed and summarized (in table 1 attached) for each slope class. However, since most agricultural soils in areas surveyed during the past year have been similar, no separation has been made to correct for erosiveness of each soil.

The average annual soil loss as expressed in various rotations can be adjusted for each locality if the annual soil loss for each crop (such as given in table 9) can be furnished by soil erosion experiment data. If no data can be obtained for all soils, at least the soil erodibility will have been estimated by SCS area office. The above discussion has been made for soils of medium to heavy texture where the entire topsoil may be lost either by sheet or gully erosion. Soil particles of all sizes are usually not removed by erosion at the same rate. However, on sandy or light textured soils sheet erosion removes the finer particles such as silt , clay, and organic portions many times faster than are the coarser sand and gravel. The silt, clay, and organic contents of light textured soil are proprotionally small. The loss of this fraction of light textured soil may reduce yields much faster than is shown by loss of depth of topsoil for medium soils. This reduction in yield may be expressed as "quality" of erosion in contrast to the loss depth of topsoil in inches in medium or heavy textured soils which may be expressed as the "quantity" of erosion. An inch of soil depth loss on sandy soil may remove the same amount of crop yielding ability as two or four inches of topsoil of a medium or heavy textured topsoil. Thus, erosion as mapped on a soil conservation survey as degree I erosion, on light textured or sandy soils may decrease yield more than the loss of one half of the entire topsoil on medium textured soils. Thus this method contains